In the Specification:

Please amend the specification as follows:

On page 4:

Flexural mechanical resonators have been used in the laboratory for rapid characterization of large numbers of fluid samples. *See* L.F. Matsiev, Application of Flexural Mechanical Resonator to High Throughput Liquid Characterization, 2000 IEEE International Ultrasonics Symposium, Oct. 22-25, 2000 San Juan, Puerto Rico, incorporated herein by reference in its entirety; L.F. Matsiev, Application of Flexural Mechanical Resonator to High Throughput Liquid Characterization, 1999 IEEE International Ultrasonics Symposium, Oct. 17-20, Lake Tahoe, Nevada, incorporated herein by reference in its entirety; L.F. Matsiev, Application of Flexural Mechanical Resonator to High Throughput Liquid Characterization, 1998 IEEE International Ultrasonics Symposium, October 5-8, 1998, Sendai, Miyagi, Japan, incorporated herein by reference in its entirety.

On Page 7:

Figure 1 is a schematic diagram of an exemplary embodiment of the present invention deployed on a wireline in a downhole environment;

Figure 2 is a schematic diagram of an exemplary embodiment of the present invention deployed on a drill string in a monitoring while drilling environment;

Figure 3 is a schematic diagram of a exemplary embodiment of the present invention deployed on a flexible tubing 13 in a downhole environment;

Figure 4 is a schematic diagram of an exemplary embodiment of the present invention as deployed in a wireline environment downhole ~~environment~~ showing a cross section of a wireline formation tester tool;

Figure 5 is an illustration of an example of the present invention showing a flow line and an associated resonator;

Figure 6 is a flow chart of functions performed in an example of the present invention;

Figure 7 lists some chemometric correlations to synthetic fluid parameter data;

Figure 8 lists some additional chemometric correlations to synthetic fluid parameter data;

Figure 9 is a conceptual comparison of the Levenberg-Marquardt non-linear least squares fit method to the chemometrics approach. The two methods can be used alone or in combination, with chemometrics providing the initial guesses for the LM fitting;

Figure 10 shows the dominant effects of fluid properties on various features of the impedance plot of a tuning fork immersed in a fluid;

Figure 11 shows a typical synthetic impedance plot used in this invention with the data plotted every 12.5 Hz;

Figure 12 shows the numerical first derivative of the **Figure 11** curve as calculated by the Savitzky-Golay formula, $(x_{m-2} - 8x_{m-1} + 8x_{m+1} - x_{m+2}) / 12$, for every 5 consecutive points, x_{m-2} to x_{m+2}. The coefficient for x_m is zero; and

Figure 13 shows the numerical second derivative of the **Figure 11** curve as calculated by the Savitzky-Golay formula, $(2x_{m-2} - x_{m-1} - 2x_m - x_{m+1} + 2x_{m+2}) / 7$, for every 5 consecutive points, x_{m-2} to x_{m+2}.

On Page 9:

DETAILED DESCRIPTION OF AN EXEMPLARY EMBODIMENT

On Page 11:

The present invention computes a result quickly, uses less computing resources and thus provides more useful and accurate initial estimates for the LM fitting parameters. The initial estimates provided by the present invention are robust, they do not require iteration, and they are quickly computed. The present invention uses chemometrics to obtain the initial estimates of fitting parameters. These chemometric estimations can then be used directly as estimates of a fluid parameter value or property or provided to the LM algorithm. The chemometric estimations provided to the LM algorithm provide a high probability of allowing the LM algorithm to converge quickly to the correct global minimum for the fluid parameter value estimation.

On Page 12:

Figure 4 is a schematic diagram of an exemplary embodiment of the present invention as deployed from a wireline downhole environment showing a cross section of a wireline formation tester tool. As shown in **Figure 4**, the tool **416** is deployed in a borehole **420** filled with borehole fluid. The tool **416** is positioned in the borehole by backup arms ~~**416**~~ 417. A packer with a snorkel **418** contacts the borehole wall for extracting formation fluid from the formation **414**. Tool **416** contains mechanical resonator assembly **410** disposed in flow line **426**. The mechanical resonator **411** or oscillator, shown in **Figure 5** as a tuning fork is excited by an electric current applied to its electrodes (not shown). The resonator response is monitored to determine density.

viscosity, dielectric coefficient and resistivity of the formation fluid. Pump **412** pumps formation fluid from formation **414** into flow line **426**. Formation fluid travels through flow line **424** into valve **420**, which directs the formation fluid to line **422** to save the fluid in sample tanks or to line **417** where the formation fluid exits to the borehole. The present invention uses the response tuning fork to determine fluid density, viscosity and dielectric coefficient while fluid is pumped by pump **412** or while the fluid is static, that is, when pump **412** is stopped.

On Page 13:

Turning now to **Figure 6**, an illustration is shown of exemplary functions performed in part as a computer programmed set of functions performed by the processor **452** in the present invention. In block **610**, the present invention performs the function of creating a synthetic data training set for resonator response (impedance versus frequency) when the resonator is immersed in various fluids. This is done in accordance with the principles of experimental design using several values (e.g., high, medium, and low value) for each fluid property (viscosity, resistivity, density and dielectric constant). In block **620** the present invention performs the function of creating chemometric equations that correlate fluid properties to impedance versus frequency for this training set of synthetic data. Examples of chemometric correlations are shown **Figures 7A-7F** (correlations to density and viscosity 702, 704, 706, 708, 710 and 712) and in **Figures 8** (correlations to dielectric constant and conductivity **803, 809, 806 and 808** and variable definitions **810).** In block **630** the present invention performs the function of applying these chemometric equations to measured resonator response so as to estimate fluid

properties such as viscosity, density, dielectric constant, resistivity and other properties. These fluid parameter values, which are determined by the chemometric equations in block **630**, are used directly as the final fluid property values. In block **640**, the present invention performs the function of using these chemometric estimates as the starting values for a Levenberg-Marquardt non-linear least-squares fit, which in turn generates the final fluid property values. The LM algorithm function runs on processor **452** and outputs fluid parameter values.

On Page 14:

Figures 7A-7F and **8A-8E** illustrate correlations to a synthetic data set that were ~~was~~ prepared using a 3-level experimental design and a theoretical model for a resonator's impedance spectrum as a function of the fluid's density, viscosity, dielectric constant and resistivity. This synthetic data set included all 81 combinations of three levels of four fluid properties, density (0.5, 1.0, and 1.5 g/cc), viscosity (0.5, 2.0, and 3.5 cPs), dielectric constant (1.5, 16, and 30), and resistivity (10^4, 10^5, and 10^6 ohm-meters). These levels were chosen to provide extremes of these properties that are not likely to be encountered in downhole fluids, thereby insuring that the resulting models are interpolating rather than extrapolating when applied to downhole fluids. One example of a suitable resonator is a small tuning fork, approximately 2mm x 5mm. This tuning fork resonator inexpensive and has no macroscopically moving parts. The tuning forks can operate at elevated temperature and pressure and enables a more accurate method of determining the characteristic of a downhole fluid, than other known methods.

On Page 16:

To help the reader visualize the synthetic data described in this invention, **Fig. 11** shows a typical synthetic impedance curve 1102 for a tuning fork immersed in a fluid. **Figure 12** shows the first derivative 1202 of the **Fig. 11** curve. **Figure 13** shows the second derivative 1302 of the **Fig. 11** curve.